

The potential of authentic learning and emerging technologies for developing graduate attributes

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Abstract

Graduate attributes, such as critical thinking and problem-solving in real-world contexts, are increasingly being recognised as crucial for students to develop in higher education for employability and critical citizenship. The question of how best to create conducive spaces in the curriculum for students to acquire these abilities is, however, less well documented. The authors propose that one way to enable students to achieve these attributes would be for higher educators to engage in authentic learning, using Herrington, Reeves and Oliver's (2010) model as a guide. In this article, one case study is selected from a sample of ten interviews conducted with University of the Western Cape (UWC) lecturers as it rated highly on all nine elements of authentic learning. The curriculum design and teaching and learning practices are analysed using each of Herrington et al's elements for authentic learning and the potential of these elements for developing graduate attributes is considered.

Keywords: authentic learning, curriculum design, emerging technologies, graduate attributes, higher education, teaching and learning

INTRODUCTION

Since the 1990s, there has been an increasing emphasis in higher education, particularly in the United Kingdom (UK), Australia and the United States (US) on the development of graduate attributes. This has come about mainly because of the pressure on higher education to prepare graduates to attain the required conceptual acumen, attitudes and skills for the workplace and to develop attributes needed for critical citizenship. Consequently, there has been concern, particularly in Australian higher education, with how to embed graduate attributes in the curriculum. Most studies have investigated ways to ensure that students are given the opportunity to develop these intended general outcomes by the end of their study period at university (Barrie 2004, 2006, 2007, 2009a, 2009b; Spencer, Riddle and Knewstubb 2012; Teater 2011; Treveleaven and Voola 2008). These studies describe the process

of alignment between generic graduate attributes (the most overarching levels of attainment) situated at the top of the hierarchy of alignment, followed by intended learning outcomes, which are usually disciplinary, followed by teaching and learning activities, assessment tasks, and assessment criteria. These studies report on how higher education institutions (HEIs) both institutionally, as well as in various disciplines, have embarked on a process of aligning their curricula.

The idea is that all of these parts of the curriculum should be in alignment with each other, and that this coherence between the elements would ultimately ensure that students would be given the opportunities to develop the requisite graduate attributes at the end of their study period. The efficacy of using strategies such as Biggs' (2012) constructive alignment to provide the necessary opportunities for students to develop graduate attributes has yet to be adequately researched and verified. The National Graduate Attributes Project (GAP) in Australia has been conducting some research on the difficulties that Australian HEIs have had in changing students' learning experiences to foster the achievement of graduate attributes. One of the problems of looking solely at curriculum alignment to achieve graduate attributes is that many of the attributes are process driven rather than content driven, and this is difficult if not impossible to measure in curriculum alignment. For example, the ability to work independently and in collaboration, to interact across difference or to be inquiry focused are not attributes which can be clearly and easily demonstrated in aligned curricula. It is also not clear that the process of alignment itself will necessarily lead to students acquiring these attributes. This article puts forward an alternative way of achieving graduate attributes by focusing on authentic learning, an approach to learning developed by Herrington, Reeves and Oliver (2010), rather than, or in addition to, curriculum alignment. A further aid to developing graduate attributes through the framework of authentic learning is by making use of emerging technologies. Emerging technologies are 'tools, concepts, innovations, and advancements utilized in diverse educational settings to serve varied education-related purposes' (Veletsianos 2010, 3). These technologies transcend disciplinary boundaries; offer new ways of interacting across contexts; and provide the potential for transformative educational practices (Veletsianos 2011). This potential can be used for transformative practices which allow for the development of the desired graduate attributes and which make authentic learning possible in higher education contexts. See Bozalek, Ng'ambi and Gachago (2013) for further ideas of how emerging technologies can be used to improve teaching and learning in South African higher education, and Bozalek et al (2013) as well as Rowe, Bozalek and Frantz (2013), more specifically for how emerging technologies can contribute to authentic learning.

WHAT ARE GRADUATE ATTRIBUTES?

Our definition of graduate attributes follows that of Barrie's (2005, 3) 'complex interwoven aspects of human ability', and Barnett's (2004, 260) view that attributes should allow graduates to learn 'for an unknown future'. They are generic abilities –

what students are able to be and to do when they leave the university (Bozalek 2012) and they supersede disciplinary expectations of students. The University of the Western Cape (UWC) embarked on a democratic and inclusive process of developing a charter of graduate attributes in 2008 and 2009. Because UWC emphasises issues of social justice, the definition by Bowden et al (2000) appeals in that it refers not only to employability but also to the social good:

Graduate attributes are the qualities, skills and understandings a university community agrees its students should develop during their time with the institution and consequently shape the contribution they are able to make to their profession and society ... They are qualities that also prepare graduates as agents of social good in unknown futures. (Bowden et al. 2000, cited in Barrie 2007, 440)

Research was conducted on student and staff needs at UWC to ascertain what their ideas of teaching and learning were and what was constraining and enhancing their abilities in this regard. The graduate attributes of other HEIs both internationally and nationally were perused to establish best practice, as well as the processes which were compatible with the vision and mission of UWC. In addition to this, the South African Quality Assurance (SAQA) study on what employers were looking for in graduates (Griesel and Parker 2009) was used as a benchmark in terms of South African graduate attributes, as it was the only study of its kind. The Charter of Graduate Attributes was ratified by the UWC Senate and Council in November 2009. The Charter outlines the UWC graduate attributes in terms of two tiers: firstly, generic attributes; and secondly, the overarching skills and abilities which would lead to achieving these Tier 1 generic attributes. They are as follows:

Tier 1 Attributes

Graduate attribute 1: Scholarship: A critical attitude towards knowledge

UWC graduates should be able to demonstrate a scholarly attitude to knowledge and understanding within the context of a rapidly changing environment. UWC graduates should have the ability to actively engage in the generation of innovative and relevant knowledge and understanding through inquiry, critique and synthesis. They should be able to apply their knowledge to solve diverse problems and communicate their knowledge confidently and effectively.

Graduate attribute 2: Critical citizenship and the social good: A relationship and interaction with global communities and the environment

UWC graduates should be engaged, committed and accountable agents of social good. They must aspire to contribute to social justice and care, appreciative of the complexity of historical contexts and societal conditions through their roles as professionals and members of local and global communities. They should demonstrate leadership and responsibility with regard to environmental sustainability.

Graduate attribute 3: Lifelong learning: An attitude or stance towards themselves

UWC graduates should be confident Lifelong Learners, committed to and capable of continuous collaborative and individual learning and critical reflection for the purpose of furthering their understanding of the world and their place in it.

Tier 2 Attributes

Overarching skills and abilities

- *Inquiry-focused and knowledgeable:* UWC graduates will be able to create new knowledge and understanding through the process of research and inquiry.
- *Critically and relevantly literate:* UWC graduates will be able to seek, discern, use and apply information effectively in a range of contexts.
- *Autonomous and collaborative:* UWC graduates will be able to work independently and in collaboration with others, in a way that is informed by openness, curiosity and a desire to meet new challenges.
- *Ethically, environmentally and socially aware and active:* UWC graduates should be critical and responsible members of local, national, international and professional communities. They should also demonstrate a thorough knowledge of ethical, social, cultural and environmental issues relating to their disciplines and make professional and leadership decisions in accordance with these principles.
- *Skilled communicators:* UWC graduates should recognise and value communication as a tool for negotiating and creating new understanding, interacting with diverse others, and furthering their own learning. They should use effective communication as a tool to engage with new forms of complexity in social and working life.
- *Interpersonal flexibility and confidence to engage across difference:* UWC graduates should be able to interact with people from a variety of backgrounds and have emotional insight and imagination to understand the viewpoints of others. They should be able to work in a productive team, to lead where necessary and to contribute their skills as required to solving complex problems.

Embedding these graduate attributes into curricula is a prominent feature in the UWC Strategic Plan on Teaching and Learning, which was also collaboratively developed and ratified through Senate in 2009. Towards this end, heads of academic departments attend Teaching and Learning retreats to begin the process of rearticulation of their programmes, examining the needs of UWC students and the desired graduate attributes. After an intensive workshop on this, teaching and learning specialists in the faculties work more closely with the entire department to embed graduate attributes (for more details about this process see Bozalek and Dison (in press)). In the past, it has been mainly curriculum alignment which has been foregrounded in the work of embedding graduate attributes. However, the potential of authentic

learning in achieving these graduate attributes, which the article examines, will be incorporated into future work at UWC in the efforts to embed graduate attributes.

AUTHENTIC LEARNING AND ITS POTENTIAL FOR ACHIEVING GRADUATE ATTRIBUTES

Authentic learning was developed as a pedagogical model by Herrington and Oliver (2000) to better prepare students for professional practice. To this end, Herrington et al (2010, 18) identified nine elements, which they argue characterise authentic learning designs. These nine elements are the following:

- *Authentic context*: for Herrington et al (2010), the curriculum should not be simplified and broken up into step-by-step processes, but should rather mirror real-world situations in order to reflect the way knowledge would be used in these situations. An authentic context leads to an intense feeling of engagement with the learning, where the learner experiences what Herrington et al (2010, 92) refer to as the ‘willing suspension of disbelief’. An example of an authentic context is a 3D virtual learning world, where the real world is simulated, and the learner loses him- or herself in this immersive environment.
- *Authentic task*: the task should be ill-defined, complex, comprehensive, and completed over an extended period of time, mirroring activities that are relevant to the kinds of problems to which knowledge is applied in the real world. Tasks which merely lead to enculturation to the classroom rather than acquiring knowledge and skills for practice in the real world, such as multiple choice tests, are discouraged as they are not considered to be authentic.
- *Access to expert thinking and modelling of processes*: both students themselves who are more knowledgeable others (Vygotsky 1978) and lecturers can enhance learning for others through sharing their different levels of expertise. The Internet as a global community also provides many opportunities for accessing and sharing expert knowledge to enhance understanding. While the lecture can play some role in sharing knowledge, it would not be regarded as sufficient for sharing expertise and modelling knowledge for real-life learning.
- *Provide multiple roles and perspectives*: students should be enabled to examine problems from more than one point of view to ensure expertise in areas. This means that it is not sufficient to provide one expert view or a single perspective in the curriculum as they should engage in debates and discussions. Complex and competing perspectives are needed for students to develop sufficient cognitive abilities to master complexity and for preparation to transfer their knowledge to the real world. Engaging with the same material at different times and for different purposes is also helpful for dealing with complexity.
- *Support collaborative construction of knowledge*: providing opportunities for students to work on a common task which is assessed collaboratively is important. It is not enough to get students to work in pairs and groups – the point should rather be that they are engaged in a genuine problem-solving task which could not be completed if it was done independently.

- *Promote reflection to enable abstractions to be formed*: it is important to provide opportunities for students to reflect in action while completing their tasks, and on action after tasks have been completed (Schön 1983). Reflection is seen in authentic learning as social and interdependent, working in collaborative groups rather than an individual process. In this way, students should be able to compare their ideas to more knowledgeable others, associating and integrating new knowledge into their conceptual frameworks.
- *Promote articulation to enable tacit knowledge to be made explicit*: opportunities should be provided for students to speak and write about their growing understanding within communities of professional practice. Vygotsky (1978) proposes that intellectual development first occurs socially between people before being internalised within the individual. It is important for students to have opportunities to present their thoughts and ideas as polished products in public such as on the Internet in blogs or in face-to-face contexts, such as colloquia and conferences.
- *Provide coaching and scaffolding by the teacher at critical times*: the idea is that rather than transmitting knowledge, the teacher's role is a supportive one. More knowledgeable students can also play this role. This implies guidance and support from teachers and more able peers during 'a significant portion of the activity' (Herrington et al 2010, 36).
- *Provide for authentic assessment of learning within the tasks*: the assessed task is the polished product at the end of the learning period which has taken a significant period to produce and is integrated with the learning tasks.

Authentic learning is a useful framework through which to develop graduate attributes as it is forward-looking, providing a way of situating learning in its context for future use in the workplace and as critical citizens, towards which graduate attributes are aiming. The model of authentic learning was developed from the cognitive apprenticeship model and situated learning (Brown, Collins and Duguid 1989) in the late 1980s (Herrington et al 2010). Because authentic learning is a pedagogical model rather than a learning theory, there have not been many criticisms in the literature regarding this model. However, some of the theories upon which the model is based, such as constructivism and situated learning, have been critiqued. Authors such as Billet (1995), who has critiqued the notion of situated learning in the workplace; Karagiorgi and Symeou (2005), who have critiqued constructivist approaches as not being applicable for instructional design and for not providing adequate structure for learning; and Shomoossi and Ketabi (2007), who argue that authenticity is a relative concept dependent on contexts where learning materials are used. However, these criticisms have been addressed in Herrington et al's (2010) framework, which has in many ways attempted to address the challenges posed by such authors by explicitly developing principles which make it easy to apply social constructivist theories to practice. The principles make it possible for educators to provide immersive and creative learning environments for their students to be able to acquire the graduate attributes, such as, scholarship, critical and digital literacy, collaborative learning,

oral and written communication skills, ethical and environmental awareness and engagement across difference.

METHODOLOGY

The current article draws on data collected as part of a larger study that was funded by the National Research Fund (NRF) which was aimed at investigating emerging technologies and their use in South African HEIs to improve teaching and learning in the sector. During August and September 2011, a survey was sent to all public HEIs in South Africa to establish the use of emerging technologies by academics and support staff. There were 262 responses with representation from all 22 public HEIs in South Africa, excluding the University of South Africa (Unisa) which only provides distance education.

A subset of ten responses submitted by UWC staff members was selected for in-depth face-to-face interviews. Respondents were selected who appeared to be using emerging technologies to provide authentic learning experiences for students. The semi-structured interviews gathered data to assess the extent to which respondents were adhering to Herrington et al's (2010) nine elements of authentic learning which are explicated above. The collected data was analysed independently by the two researchers using the following coding system: 0 – no evidence, 1 – weak evidence, and 2 – strong evidence of authentic learning elements. Discrepancies were averaged after discussion.

The researchers selected one of the interviews to be used as a case study, which was highly rated in relation to the nine elements of authentic learning. This case study was used to investigate the extent to which the curriculum and pedagogical practice described in the interview had the potential of developing Tier 1 and Tier 2 graduate attributes. The transcribed interview was analysed using both the principles of authentic learning and Tier 1 and Tier 2 UWC graduate attributes. Quotes from the transcription were selected which indicated instances of graduate attributes and authentic learning principles.

The research project received ethical clearance from UWC.

FINDINGS

The demographics of the sample of ten included a range of disciplines as well as a range of experience as can be seen in Table 1.

Table 1: Demographics of sample

Gender		Discipline		Years of teaching experience		Level of appointment at UWC		Highest qualification	
Female	4	Natural Sc.	2	1–5 years	4	Ass/Prof	2	Doctorate	6
Male	6	Applied Sc.	4	6–10 years	3	Snr lecturer	1	Masters	3
		Social Sc.	3	11–20 years	1	Lecturer	5	Honours	1
		Commerce	1	> 20 years	2	Non-academic	2		
Total	10		10		10		10		10

Table 2 depicts the sum of the ratings for each of the nine elements given by the two researchers. As described in the previous section the highest possible score was ‘4’ which indicates that both researchers identified strong evidence for the element in the teaching of the interviewee.

Table 2: Summary of ratings given to respondents for each authentic learning element

Respondent	Authentic Context	Authentic Task	Expert Performance	Multiple Perspectives	Collaboration	Reflection	Articulation	Coaching and Scaffolding	Assessment	Total
R1	4	3	2	3	2	4	2	3	4	27
R2	1	1	1	3	3	1	2	3	1	16
R3	4	2	3	3	4	2	4	4	2	28
R4	4	4	3	4	4	4	2	4	3	32
R5	3	3	4	4	1	4	2	4	2	27
R6	2	2	2	2	4	3	2	3	2	22
R7	4	4	4	4	2	3	3	3	2	29
R8	4	3	1	3	3	3	3	3	3	26
R9	2	2	2	3	4	2	2	4	1	22
R10	4	4	4	4	4	4	4	4	4	36

Table 2 shows that:

- One respondent (R10) was rated as demonstrating strong evidence for all nine elements. This respondent was presenting an online postgraduate module aimed at developing research skills in women’s and gender studies students.
- One respondent (R2) was rated as not demonstrating ‘strong evidence’ for any of the nine elements by one researcher and for only three elements by the other researcher (indicated by a score of 3). This respondent obtained the lowest overall score (16). The respondent was using the same technology for all his teaching and learning and the researchers felt this did not represent an authentic learning experience for students.

- The case study presented below develops the responses of respondent (R4) in relation to authentic learning and graduate attributes. This respondent was rated as demonstrating ‘strong evidence’ for six of the elements by both researchers. He was teaching a module to undergraduate physiotherapy students. This case study was specifically chosen as the R10 case study was an international course which did not deal with UWC graduate attributes. Respondent (R4) was located at UWC and thus the graduate attributes were pertinent to the study.

As can be seen from Figure 1, the element ‘assessment’ was rated on average as the least strong element (24) and the element ‘coaching and scaffolding’ the most commonly observed element (35) across the ten respondents. It could be argued that ‘assessment’ is an area over which lecturers have limited control as modules are required to meet external requirements that mitigate against innovative practices. In contrast the element ‘coaching and scaffolding’ falls squarely within the domain of teaching and learning.

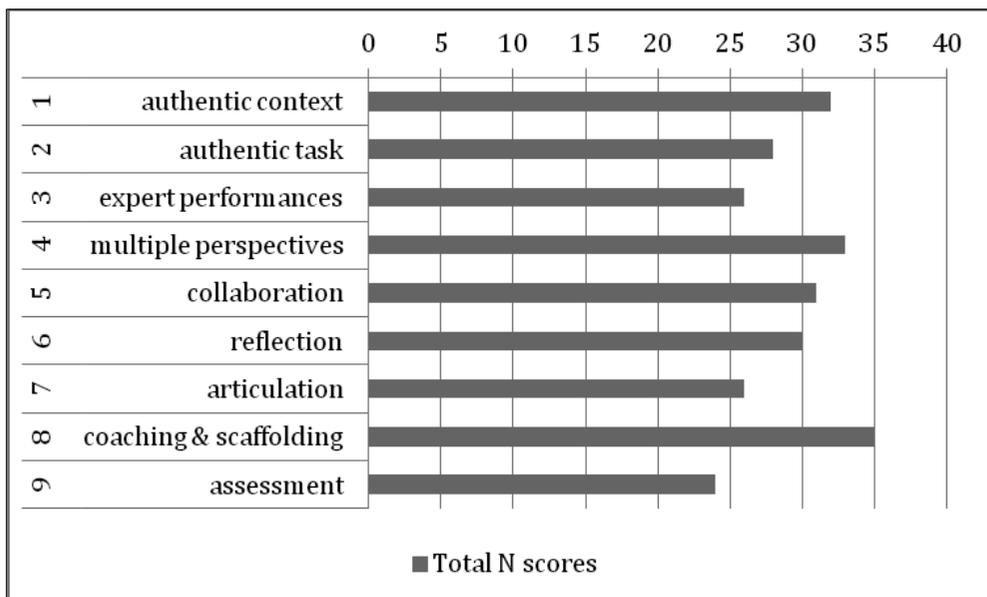


Figure 1: Summary of ratings by element for all ten respondents

A CASE STUDY OF AUTHENTIC LEARNING AT UWC AND HOW IT RELATES TO GRADUATE ATTRIBUTES

Figure 2 summarises the ratings for authentic learning for respondent (R4) used in the case study.

As can be seen in Figure 2, both raters assessed the teaching by R4 as showing strong evidence of elements 1, 2, 4, 5, 6 and 8 while elements 3 and 9 were assessed ‘strong’ by only one rater. The remaining element, ‘articulation’ (7) was rated as

‘weak’ by both raters. The following analysis compares the extent to which the curricula and teaching practices of R4 relate to the goals of Tier 1 and Tier 2 graduate attributes and to the nine elements of authentic learning.

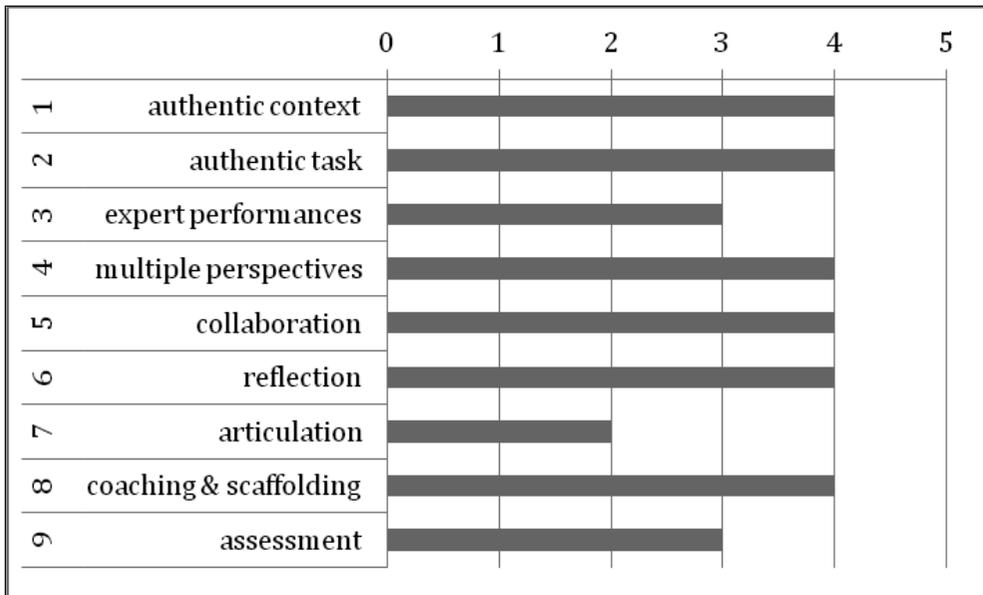


Figure 2: Ratings for the nine elements for respondent (R4)

Table 3: Example of case study showing authentic learning, graduate attributes

Elements	Graduate attribute Tier 1	Graduate attribute Tier 2	UWC Lecturer (R4)
Authentic context	Barnett’s idea of complexity and uncertainty scholarship lifelong learning	Critically and relevantly literate (2) Ethically, environmentally and socially aware and active (4)*	<i>In order to teach physiotherapy, the educator has developed written cases to improve the clinical reasoning process; ... We introduce and encourage the idea of uncertainty and we try and give the students opportunities to learn how to be comfortable with the complexity and uncertainty of the clinical context and then to give them skills to navigate that uncertainty – rather than just being flawed and overwhelmed by all the different variables ... We need to give them skills now for then to able to go into the real world and say I don’t have this answer, now what do I know, what do I need to find out, how will I find out.</i>

Authentic task	Scholarship	Inquiry focused	<i>In the past we would have lectured on a series of conditions and say these are the conditions that you need to be aware of now what we do we give them a case and each case runs every 3 weeks every week we introduce complexity to the case so we add more information – sometimes we give readings, sometimes there is a video that they have to go and watch but all the time we are building on what they know and then what they need to know and we are trying to make the cases typical presentations of what you might expect in a South African context [T7] .</i>
Expert performance		Inquiry focused (1) critically and relevantly literate (2)	<i>One of the 1st assignments we did in this module was we gave them a task where they had some readings and they had to develop a list of criteria that they would use to establish credibility in online sources.</i>
Multiple perspectives		Inter-personal flexibility (6)	<i>You can have clinicians who would disagree on appropriate management strategies for patients and how do you negotiate kind of a compromise between what you think is right and what someone else thinks is right so we do try and model that. What [T8] we will often do is students will ask me a question and I will say well this is what I think but let me just grab this other person who I know has a different view and then we pull facilitators into the conversation and then we discuss the difference in the view point and model to the students that often times there is no right answer.</i>
Coaching and scaffolding		Critically and relevantly literate (2) Inter-personal flexibility (6)	<i>So in terms of scaffolding students have to have a base and from that base they can build, if the base is shaky we try and design the case so that its difficult for them to proceed without having an understanding of what they did in the beginning. Feedback - we try and encourage all the facilitators to give feedback in the form of a question rather than saying this is wrong, this is right, this is excellent. So even this is excellent is not useful feedback because students has no way to go from that. ... we guide facilitators on how to give feedback so in terms of the scaffolding I think we try and always say why do you say that? What are you basing that on?</i>

Reflection		Skilled communicators (5) Inter-personal flexibility (6)	<i>We model reflection we go on and on about how reflection is really important for professional development, there is just this block with the students where its just thinking we talk about if you don't have any emotional investment in what you are doing then but the students are very resistant to reflection.</i>
Assessment		Critically and relevantly literate (2)	<i>At the end of every term the students have to submit a clinical file which is a collection of documentation that they have gathered that relates to their patients' contact so there is a clinical evaluation tool where there are patients documentation notes, reflections, they have set learning objectives.</i>
Collaboration		Autonomous and collaborative (3)	<i>They are in different groups. When they go out in a clinical practice they are in one group and in the classroom they are in a different group and the idea is that students learn things on a clinical experience and they bring it back to the classroom experience so on the Monday morning they set aside time where they discuss the patient they saw the previous Thursday and we try to get them to bring their own clinical stories back into the classroom and then the facilitators can discuss those experiences. We try to build in collaboration we don't give them notes they have to collaboratively build the notes in their groups with inputs from facilitators.</i>
Articulation		Skilled communicators (5) Inquiry focused (1)	<i>At the end of every case each group has to have a set of case notes where they have drawn up about their understanding of this particular patient. Every group must do a full case presentation that they are graded on at the end of each case. We challenge every single statement that the student makes that is not explicitly guided by a reason...</i>

The respondent's elaboration on how his curriculum design and pedagogical practice cohered to the nine elements of authentic learning has a great deal of resonance with what would be required in the workplace as a physiotherapist. His description of the authentic context with the emphasis on both uncertainty and complexity very much mimics what would be happening in the world of employment. Human service practitioners are always facing situations where they have to think on their feet and where they are searching for the most suitable answers to complex situations. In the authentic task, the students' prior knowledge is ascertained and the further acquisition

of knowledge which is relevant to the South African situation in physiotherapy is scaffolded using different media, depending on the students' needs. It is clear that in order to develop the required graduate attributes, students need to be active participants in the process of learning, a point which has been emphasised by Biggs (2012), and their learning needs must be sensitively responded to. In the respondent's description of expert performance he indicates how he and his team of facilitators assisted the students with digital literacy, thus developing the important graduate attribute of discerning what is relevant and authoritative knowledge, a crucial skill for future practice. In his description of multiple perspectives, the respondent describes how the pedagogical practice cleverly mirrors and models what happens in real life practice. Usually individual teachers are inclined to set themselves up as experts and all-knowing repositories of knowledge. In his pedagogical practice, he demonstrates that knowledge does not reside in one person or in one disciplinary area, by calling on his peers to answer questions and by referring to alternative sources of knowledge from a range of disciplinary contexts.

The respondent's explication of coaching and scaffolding is interesting in that feedback is given as a form of further interrogation of what the student has done – thus promoting clinical reasoning. Rather than commenting on the quality of the students' responses – good, excellent, and so on – a more useful way of developing the skills to engage in evidence-based practice is to get the students to answer questions about why they are doing what they are and eventually for them to internalise this inquiry-focused approach to learning and practice. The importance of educating facilitators on how to give feedback is foregrounded in his description of coaching and scaffolding the clinical reasoning skills.

The respondent is honest in reporting that students are resistant to reflecting *on* their practice – although the questioning while they are working would provide good opportunities for reflecting *in* practice (Schön 1983). This is perhaps a limitation in the respondent's curriculum and pedagogical practice which needs further thought in order to develop reflection on practice as it would be required in the clinical employment setting for patient progression, report writing, presentations and improvement of knowledge and skills in the workplace.

The collaborative writing of clinical notes is good experience for the students, as they will more than likely be required to work with colleagues in teams and to share professional opinions in case discussions, and so on. Getting input from the facilitators as more knowledgeable others also hones skills needed for critical thought and academic writing, which is increasingly a requirement in the workplace, with its emphasis on lifelong learning through the formal process of continuous professional development. What is not apparent in the quotes in the table is that the respondent made use of emerging technologies, such as Google Drive, where students developed collaborative notes and where they received feedback from facilitators (see Rowe et al 2013 for more details regarding this). Thus, emerging technologies can be considered to facilitate the principles of authentic learning by providing access to expert feedback and supporting collaborative construction of knowledge. In this course a wiki was used to produce physiotherapy knowledge which was made available to a wider audience for comment through the world wide

web, thus providing articulation for a product of the students work on the course. Herrington et al (2010) explicitly recommend e-learning and emerging technologies for the achievement of authentic learning where complex knowledge and skills can be practised and acquired.

In his reporting on assessment as an element of authentic learning, it appears that the students accumulate evidence of their own learning objectives in a clinical file, which would be a similar sort of task required in the world of work. This is much more authentic as a form of assessment than administering multiple choice tests as Herrington et al (2010) note. In terms of articulation, students are required to present their cases and account for their actions when being questioned by their peers and the facilitators regarding the basis on which they have acted and made their judgments. This public articulation of their actions and the explanations for why they acted models the process of clinical reasoning required for the field.

All of these nine elements of authentic learning in the case study can be seen as building the desired attributes that physiotherapists would need when they are beginner practitioners in the field. In other words, they provide a powerful framework for the development of desired beings and doings of a graduate physiotherapist.

In terms of the achievement of UWC graduate attributes, the above analysis shows that two of Tier 1 graduate attributes, namely 'scholarship' and 'lifelong learning', were obtained in the case study by engaging in pedagogy which uses the nine elements of authentic learning. However, the graduate attribute focusing on 'critical citizenship and the social good [T9]' does not appear to be significantly addressed in the authentic learning elements reported in this case study. In the case of R4 who is preparing physiotherapists for *their* world of work the attribute is partially present under 'authentic context'. The lecturer is focusing on developing students' clinical reasoning skills which will allow them to make sound decisions, rather than teaching them to believe that they just need to follow set procedures. If they are able to acquire these skills through the curriculum design and pedagogical process, they will be assisted to act professionally and ethically in their world of work. This would be covered in the Tier 2 attribute described as having UWC graduates who are 'Ethically, environmentally and socially aware and active' (R4).

In reviewing the teaching practices and curricula of the other nine respondents, it was found that the graduate attribute referring to developing active citizens was least likely to be present. It was more often likely to be included in the curricula when such an attribute was considered essential in the world of work, for example, social work. However, there was one example in the sciences where the respondent (R7) required students to address environmental issues as part of their adaptive management module.

CONCLUSION

The case study provided an example of how effective the elements of authentic learning can be in developing the values, skills and attributes that a university student should have acquired at the end of his or her degree. It would seem that only by engaging

students in authentic tasks which have their focus on real-world consequences and learning, is it possible to develop the requisite attributes for employability. Emerging technologies are useful for being able to accomplish the complexity and support required by the authentic learning tasks. It can then be concluded that constructive alignment of curriculum in itself may not be enough to ensure that students acquire graduate attributes by the time they leave the university. The current case study has demonstrated that designing a curriculum and developing innovative pedagogical practices which encourage critical reasoning or critical thinking provides an effective strategy for the development of graduate attributes in students. The study has demonstrated that authentic learning elements that were used for developing clinical reasoning skills were effective in achieving two of the overarching graduate attributes, namely, scholarship and lifelong learning. The third UWC graduate attribute which addresses critical citizenship was not directly addressed through the use of any of the nine elements of authentic learning in the case study. However, the general study which included the other nine in-depth interviews regarding authentic learning showed strong evidence of critical citizenship being seen as a primary goal of teaching and learning by at least one lecturer in the research group.

If we take into account the necessity for engaging students who are not always adequately prepared for higher education through their prior learning in the school environment, it is necessary to find practical ways in which students would be able to develop from where they are when they enter the higher education environment, to what the university wishes the students to be and to do at the end of their university degree. Our contention is that the nine elements of authentic learning offer one such practical framework for achieving this, and that emerging technologies, in turn, provide a vehicle for authentic learning to be facilitated.

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